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The following Paper was read :—

On the Geography and Mountain Passes of British Columbia, in connection with an Overland Route. By ALFRED WADDINGTON, Esq.

THE author commenced by stating that the possibility of opening a direct and available line of communication between Canada and the Pacific Ocean, through British North America, had been for many years a subject of doubt. This was chiefly owing to our imperfect acquaintance with the geographical features of the country west of the Rocky Mountains. He had himself spent more than five years in various efforts to explore British Columbia with this view, and had equipped and sent out numerous exploring parties in all directions; the result was the discovery of a practicable route for a railroad through the Cascade Range and the survey and partial opening of 222 miles of road through a previously unknown country, between the coast and the mouth of the Quesnelle River, which must necessarily form the first link in any future overland route. British Columbia was to a great extent occupied by two ranges of mountains running N.N.W., but gradually diverging from each other as they advance towards the north, where they enclose a vast central plain. The main crest of the eastern range, or the Rocky Mountains, forms the eastern boundary of the colony, and comprises several peaks rising to the height of 16,000 feet; but these mountains in British Columbia are composed of three distinct chains, divided from each other by rivers and deep valleys. The middle range presents one uninterrupted line of mountains (some of them 12,000 feet high) for a distance of 240 miles. The travellers who have discovered the principal passes in the Rocky Mountains had been unable to push their explorations beyond the eastern or upper portion of the Columbia River, so that neither the middle range nor the western one had been hitherto examined. These were, however, carefully explored in 1867, and it was proved that no practicable pass existed through the middle chain. The western range rises from 4000 to 8000 feet in height, and south of Fort Shepherd it is composed of no less than eleven sharp and nearly parallel ridges. The only good pass from the Columbia River, through this third range, is in 50° 56' N. lat., near the southern end of Sushwap Lake, and was discovered in 1867 by Mr. Moberly, the Government Engineer at Eagle Creek. There is, however, this important feature in the middle and western ranges, namely, they both become gradually lower north of Cariboo, and this depression forms a large tract of level country on the south side of the Upper Fraser, most suitable for the passage of a railroad through this difficult country. The average width of the Cascade or Coast Range is about 110 miles; it

forms a sea of mountains, some of which reach an altitude of 10,000 feet. Near the boundary line this range throws out a spur east and north, so as nearly to connect it with the Rocky Mountains. It is over the formidable Alpine masses here grouped together that the present wagon-road lies towards Cariboo; and it has been pronounced by competent authorities that there is no reasonable way of getting over it with a railroad. After examining the various deep fiords along the coast north of Fraser River, the author had finally given the preference to Bute Inlet, as being by far the best starting-point for an overland route to Canada from the Pacific. Its advantages were: a better harbour, a passage through the Cascade Range by the river valley at its head, and its proximity to the best part of the great central plain before mentioned, across which the proposed road would pass to the Upper Fraser and the Leather Head Pass of the Rocky Mountains. The author had well explored the head of the inlet, and had surveyed the road through to the plain. The trail cuts through the Cascade Mountains by a deep valley, and rises imperceptibly for 84 miles to its maximum height of 2500 feet, and the communication is open throughout the winter. The valley of the Homathco River at the head of the inlet is 80 miles in length, and varies in width from three miles to less than a quarter of a mile. It is in general heavily timbered, but contains rich bottoms capable of producing any kind of crops. The central plain, at the point where it is crossed by the proposed road, is 120 miles wide, and has vast pasturages and park-like scenery. The Leather or Yellow Head Pass is preferable to any other through the Rocky Mountains, not only on account of its low altitude (3760 feet), but from its easy gradients and the superiority of its approaches both from the eastward and the westward. The author concluded with a few remarks on the urgency of a direct overland communication between Canada and the Pacific, through British territory. In a political point of view, and as a natural consequence of the late confederation, it would contribute essentially to its prosperity. At present England has no other communication with the Pacific but by New York and San Francisco; and the Red River Settlement remains isolated, midway between our Atlantic and Pacific Colonies.

The paper will be printed *in extenso* in the Journal, vol. xxxviii.

MR. WADDINGTON made the following remarks in addition to his paper. He said that Mount Baker was an active volcano, and that Mr. Coleman, of Victoria, formerly a member of the Alpine Club, had twice attempted the ascent in company with Mr. R. Brown; once they were stopped by an Indian chief, and the second time, making the attempt by the northern side, they were arrested near the summit by immense cliffs of snow and ice. The eruptions of this mountain consisted of vapour and smoke, but no lava had yet

been seen to come from it. About two years ago an eruption took place, simultaneously with the earthquake at San Francisco, and on that occasion one of two peaks which formed the summit partially fell in. With regard to the overland route which he proposed, he believed he had shown the practicability of opening such a communication between the eastern and western sides of the North American continent, in British territory. The distance from Montreal to the head of Bute Inlet was 3490 miles, while the distance between New York and San Francisco was 3300 miles. Out of these 3490 miles, 2400 would consist, according to his plan, of steam-boat navigation along the rivers and lakes. At the commencement there would be 442 miles of railroad from Montreal to Collingwood, the head of the Canadian railroad system on Georgian Bay, which connects with Lake Huron and Lake Superior, and on the other parts of the line there would be 648 miles of dray-road; of which, with the assistance of gentlemen in this country, he had engaged to make 222, that is, the section between the head of Bute Inlet and the mouth of the Quesnelle, a tributary of the Fraser River. The Canadian Government had engaged to make the road between Lake Superior and Fort Garry, the head of the Red River Settlement, excepting the 91½ miles between the Lake of the Woods and the Red River, which the authorities of the settlement had pledged themselves to open. Consequently there remained only 140 miles east of the Rocky Mountains, between Edmonton and the Yellow Head Pass to be provided for. The road would therefore consist of the following sections. Starting from Lake Superior, the first piece of road, 28 miles in length, to Dog Lake, was already begun by the Canadian Government. Then came 35 miles of navigation through Dog Lake and along a portion of Dog River. To this succeeded a portage of 5 miles; then 65 miles of navigation again, with another break of 66½ miles; then 208 miles of navigation along the Rainy River and through the Lake of the Woods to the end of Shoal Lake; after this there were 91½ miles of plain road from Shoal Lake to Fort Garry. From Fort Garry the route took a northerly direction down the Red River into Lake Winnipeg; up Lake Winnipeg; then along the Saskatchewan the whole way to near the foot of the Rocky Mountains for a distance of 1249 miles in one stretch, with the single break of the rapid, called the *Grande Rapide*, at the mouth of the Saskatchewan and Lake Winnipeg. Those 1249 miles could be made, at very slight expense, easily navigable by steam-boats. Touching the navigation of the Upper Saskatchewan in the autumn, when the waters are low, the general opinion—in which Sir James Douglas, former Governor of British Columbia, concurred—was that light steamers could run during the whole season, except when stopped by frost. With regard to the 140 miles between the Saskatchewan and the Rocky Mountains, it was a question whether this section should be opened by the Canadian Government or the Hudson's Bay Company; the Crown having declined to have anything to do with it. Then came the Upper Fraser, which formed a circuit round the Cariboo Mountains of 280 miles. The Upper Fraser was perfectly navigable for steamers; it was as quiet as the lower part was impetuous and rapid. From the mouth of the Quesnelle, where these 280 miles terminated, he proposed a line of railroad, 222 miles in length, which would take the route to Bute Inlet, where there was a good harbour and the easiest communication with Victoria. He had been down twice in a steamer in sixteen hours from Bute Inlet to Victoria. The entire communication could be opened at very small expense, and in a very short time. The Hudson's Bay Company had almost promised that they would put steamers on the Upper Fraser, if the scheme were carried out in British Columbia. On the Saskatchewan the question was still to be settled, because for the first two or three years the steamers would have to run for nothing; and some plan must be found of subsidizing them, either by grants of land or money. He had forgotten to mention that the distance from Collingwood to the north-west end of Lake Superior was 534 miles. With reference to the questioned advantage of

opening this country, Mr. Waddington stated that the region traversed by the Saskatchewan, for a distance of 1250 miles, was remarkable for its fertility and good climate. He also pointed out the political and commercial importance of forming a connection between Canada and British Columbia, and of opening a road to the Red River Settlement, which was at present isolated from the rest of the world. The traders at Red River Settlement were obliged to go to St. Paul for all the goods they required, a distance of 580 miles, at a charge of 120 dollars per ton. Moreover, American squatters were pushing their way into Red River Settlement with the view to divide British Columbia from Canada. Mr. Waddington finally called attention to the rapid progress being made by the Americans with their Central Pacific railroad connecting New York with San Francisco, which would be finished in 1870, and strongly urged that this country ought not to allow itself to be outstripped in the race.

The PRESIDENT remarked that the portion of the paper which more particularly concerned them as geographers, was that which described the previously unexplored districts of British Columbia. Mr. Waddington had shown that the Yellow Head Pass—the pass which Lord Milton and Dr. Cheadle had chosen—was the very best pass for transit between the east and west. But instead of passing down to the mouth of the Fraser River, as Lord Milton and Dr. Cheadle proposed, he had pointed out an entirely new route by the head of Bute Inlet, which conducted into a level country which was easily traversible by railroad. His description of the Bute Inlet road and the Rocky Mountains was entitled to the highest commendation as an important addition to our geographical knowledge.

Captain G. H. RICHARDS said he had spent nearly seven years surveying the sea-coasts of British Columbia and Vancouver Island, and he could conscientiously support the views of Mr. Waddington. The question of a route connecting Canada with the colonies on the Pacific coast was of vital importance no less to this country than the colonies. So soon as that route is accomplished, federation between Canada and British Columbia would be effected, and the retention of British Columbia would be secured. At present British Columbia and Vancouver Island were cut off from this country by 16,000 miles of sea, and were entirely dependent on the British Navy for their protection. So soon as there was a route opened throughout our own territory, all this would be changed. Of the three routes which had been alluded to, the North Bentinck Arm route was too far north; and the Fraser River, though it had many advantages which Mr. Waddington had in his opinion under-estimated, being more available for navigation than he allowed, would not, however, become the western terminus of the route, owing to the obstacles intervening between its lower course and the head of the navigation. The Fraser River was a magnificent stream in its lower part, and it was available for navigation and commerce in suitable vessels; but in the upper waters existed the rapids and mountain ranges which Mr. Waddington had spoken of. If there were not these difficulties he should be in favour of the Fraser River, simply because it was further south, consequently in a less rigorous climate, and it was also the natural opening into the country. Bute Inlet was more likely to be the western terminus of an overland route than any other on the coast. He congratulated Mr. Waddington on his able paper, and on the great perseverance, energy, and industry which he had shown in the exploration of this route; and he hoped he would be rewarded by seeing his schemes carried out.

Dr. RAE said he found the latitudes and altitudes given by Mr. Waddington agreed almost exactly with his own. He had been down the bend of the Fraser River in small canoes with the view of examining telegraph-routes. He saw several places that could not be made navigable for steamers; and there was one rapid that ran at the rate of about 15 miles an hour, full of rocks and stones, five miles long, above Fort George. Some of the ablest men from the Red River were in his party, and they said they never passed

worse rapids in their lives. Above the Quesnelle the rapids were so bad that nearly every year men were lost in them, and it was only the expertness of his own men that saved his party from being lost once or twice. In another part of his route, he might add, that two years ago a gentleman was sent to examine the Saskatchewan for the purpose of ascertaining whether it was practicable for steam-navigation, and his report was unfavourable. It is true the year he was there might have been an exceptional one. He believed these rivers, though probably practicable at one time for steam-navigation, had become, from the wearing away of the banks and the widening of the stream, much shallower, and consequently less available for steamers. The late Governor of the Hudson's Bay territory, Mr. Dallas, was the first to point this out to him with regard to the Red River, on which a steamer was placed some years ago, but it had scarcely ever made more than one trip every season since, in consequence of the shallowness of water. At Fort Garry, within the memory of man, the river was so narrow that a person could throw a stone across; it was now several hundred yards wide, and the depth of water was thereby diminished.

Mr. DALLAS, late Governor of Prince Rupert's Land, had great pleasure in bearing testimony not only to the accuracy of Mr. Waddington's description, but to the time, labour, and money he had bestowed upon these explorations. He was entitled to the merit of being the first to explore the territory from the head of Ponte Inlet, through which he had drawn his proposed railway. With regard to the navigation of the Saskatchewan, he could confirm what had been said by Dr. Rae. All these rivers were gradually getting wider, their beds were rising, and, in consequence, their waters were every year assuming different channels. The Saskatchewan partook of the character of a mountain stream; during one portion of the year there was a very large body of water, at another portion it was very shallow, and much obstructed by sand-bars. Therefore, they must not rely too much upon water-communication as a through-line of route across the continent. To compete with the Americans we shall have to depend upon a railway. He had gone over the whole line of the Saskatchewan, both by land and water, and he thought a railroad could be made with the greatest facility, including that part of the region where water-communication could no longer be relied upon.

Dr. CHEADLE, the companion of Lord Milton in an exploration across the Rocky Mountains, said he agreed generally with Mr. Waddington's views. There were one or two points, however, in which he differed from him. One was as to the navigability of the Upper Fraser, in which, as Dr. Rae stated, there were so many rapids that it would hardly be available for steamers. The country from the Red River Settlement to within 200 miles of the Rocky Mountains was so level that a railroad could be made without any difficulty. The only question was, having crossed the Rocky Mountains by the Yellow Head Pass, how were we to get from that point to the level plain on the west? Supposing it were impossible to take a steamer along the Fraser from the western extremity of the Yellow Head Pass to the mouth of the Quesnelle River, he apprehended it was quite practicable to follow the route taken by Lord Milton and himself, down the north branch of the Thompson River, and so descend upon the southernmost portion of this great central plain. It was of very great importance that this route should be opened as soon as possible, in order to connect British Columbia with Canada. A Commissioner sent by the State of Minnesota to examine the land in the region of the Saskatchewan, reported that it was of the highest value—"a country worth fighting for." Already American squatters were flocking into the territory, and were telling us that "the boundary line was 50 miles too far to the south."

Mr. FREDERICK WHYMPER said he had been over a large portion of Mr. Waddington's route, and he must pay a compliment to his engineering skill. He had scarcely, however, mentioned the magnificent glaciers which were so

grand a feature in the country, particularly those at the head of Bute Inlet. The largest glacier was ten miles long and three-quarters of a mile across. The terminal *moraines* were very strongly marked. He (Mr. Whympere) had a very vivid recollection of that visit, having narrowly escaped the fate that befel the larger part of the road party, who were murdered by the Indians but two days after he had left them. His guide, an old Chilicoten chief, was subsequently hung for his share in that terrible massacre.

Mr. WADDINGTON, in reply to the statement of Dr. Rae with regard to the Saskatchewan, said he held in his hand a printed report from Mr. Alfred Perry, a well-known and reliable traveller. It was dated June 6th, 1861, and was to the effect that the Saskatchewan was available for steam-navigation. It stated, moreover, that from the "Rapide des Fourneaux," eight miles below the Yellow Head C  che down to the mouth of the Quesnelle, the Upper Fraser was navigable for steamboats; that the river was not less than six feet deep in the shallowest parts, and the current slow, more like a lake than a river. He had also the opinion of Sir James Douglas with regard to the Upper Fraser. There were four rapids. The worst was the *Grande Rapide*, above the mouth of the Quesnelle; and Sir James Douglas said he was convinced it was not so bad a rapid as the Emory Rapid below Fort Yale, which had been considered impracticable for several years, but was now steamed over daily. If necessary, he could take his railroad 19 miles higher up the plain, and thus avoid this rapid.

Dr. R  E said that, at the time of year he was there, the water in the river was so low that no steamer could navigate it.

Mr. WADDINGTON added, he had talked the matter over more than once with Mr. Brewster, his deceased foreman, who had been over the route, and that gentleman assured him that a steamer could get through at any time.

The PRESIDENT wished to make one observation in conclusion, and that was to repeat what he had said at the commencement of the discussion, namely, that the essential part of the paper was the geographical portion, describing the new route Mr. Waddington had explored from the Bute Inlet, with a view to a railroad connection between our colonies on the Pacific and Canada. If that railroad were ever made, to Mr. Waddington would belong the credit of having pointed out the most practicable and easy line for the purpose.

ADDITIONAL NOTICES.

(Printed by order of Council.)

1. *Additional Notes on the Geography of Southern Peru.* By WILLIAM BOLLAERT, Esq., F.R.G.S., &c.

IN Volume XXI. of the 'Journal of the Royal Geographical Society' will be found my first paper "On Southern Peru, with Survey of the Province of Tarapac  ," by my friend Mr. George Smith, F.R.G.S., and myself, in 1827, but brought down to the date of publication, viz., 1851.

Since then, I have again visited Peru, and explored more particularly the southern portion, which has become an interesting commercial locality, in consequence of the working of the vast deposits of nitrate of soda, and the discovery of the valuable borate of soda and lime; and I have brought the additions to the Map of the Province of Tarapac   up to 1866.

The nitrate of soda is a well-known fertiliser, extensively used in the arts,